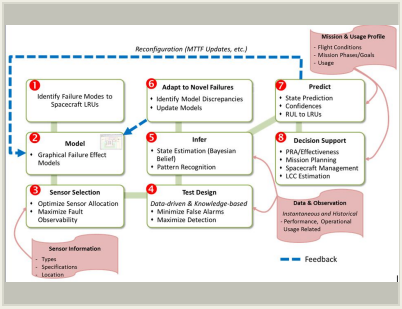
Small Business Innovation Research/Small Business Tech Transfer

Integrated System Health Management for Flexible Exploration, Phase I

Completed Technology Project (2012 - 2012)

Project Introduction

Long-duration robotic and manned space missions have a number of unique requirements for mission success. These include ultra-high reliability, safety, sustainability and affordability of launch vehicles and spacecraft. These requirements, in turn, are allocated among critical subsystems, such as engines, propellants, structures, software systems, thermal protection, power, avionics, life support, guidance, communication and navigation. In this vein, novel integrated system health management (ISHM) technologies that evolve with the system life-cycle, viz., concept-> design-> development-> production-> operations and training, are essential for meeting the requirements of safe and ultra-reliable, sustainable and affordable launch vehicles and spacecraft. NASA has been employing a number of reliability tools and methods, FMECA, FTA and PRA, for designing reliable and safe systems. However, the current methods are ad hoc, prone to errors and do not evolve with the system life-cycle. In response to these challenges, Qualtech Systems, Inc. (QSI) propose to develop an integrated system health management (ISHM) tool and a concomitant process for new heavy lift launch systems and exploration precursor robotic missions. The new risk and design analysis tool, when coupled with QSI's diagnostic and prognostic tools (QSI's Testability Engineering and Maintenance System (TEAMS) toolset) will simplify early-stage design of health management functionality during the development of space systems (e.g., safety and mission assurance analysis, failure modes, effects and criticality analysis, hazards analysis, functional models, fault propagation models, testability analysis, design for serviceability, sustainability and affordability). The TEAMS SW suite already hosts a number of these desired capabilities. Consequently, QSI proposes to introduce additional modeling and analytic capabilities to TEAMS and enhance the existing, so as to make it an enhanced support tool for ISHM.



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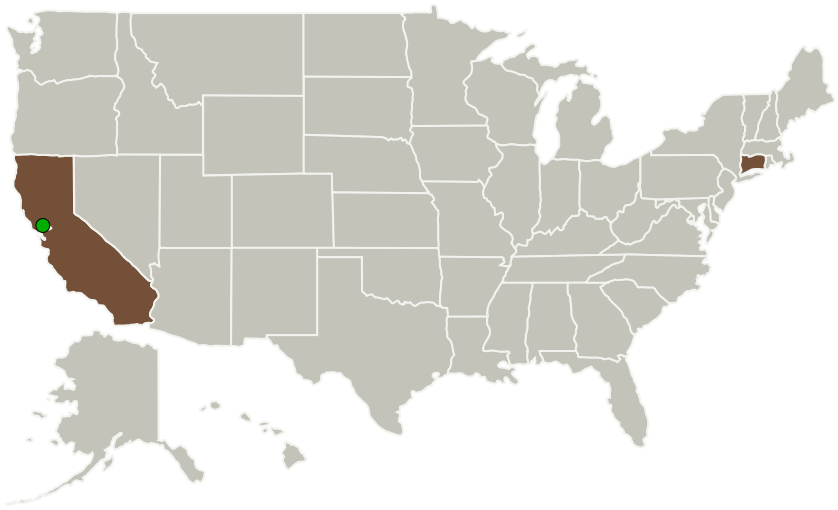
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Qualtech Systems, Inc.	Lead Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB)	Rocky Hill, Connecticut
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California

Primary U.S. Work Locations	
California	Connecticut

Project Transitions

February 2012: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Qualtech Systems, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Sudipto Ghoshal

Co-Investigator:

Sudipto Ghoshal

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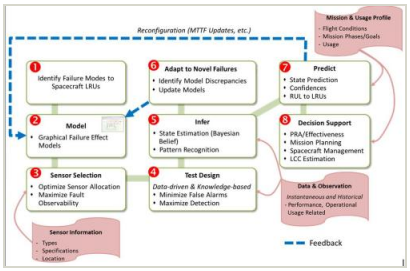
August 2012: Closed out

Closeout Summary: Integrated System Health Management for Flexible Exploration, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image*(https://techport.nasa.gov/file/140314)*

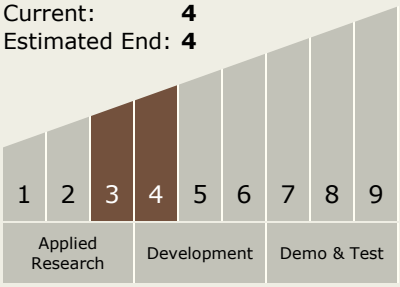
Images



Briefing Chart Image
Integrated System Health Management for Flexible Exploration, Phase I
(https://techport.nasa.gov/image/135584)

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX17 Guidance, Navigation, and Control (GN&C)
  - TX17.2 Navigation Technologies
    - TX17.2.1 Onboard Navigation Algorithms

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System